

Name: \_\_\_\_\_

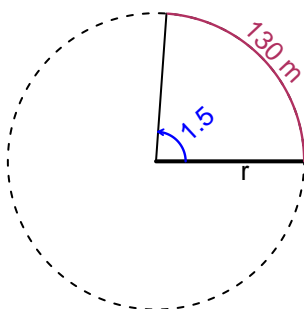
Date: \_\_\_\_\_

## Trig Final (Solution v45)

- You can use a calculator (like [Desmos](#))
- You should have a unit-circle with special angles and coordinates marked.

### Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 1.5 radians. The arc length is 130 meters. How long is the radius in meters?

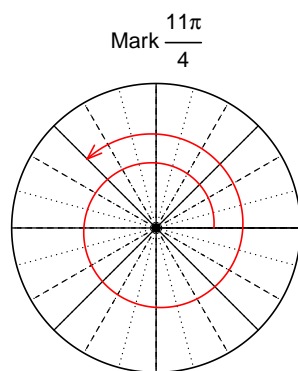


$$\theta = \frac{L}{r} \quad r = \frac{L}{\theta} \quad L = r\theta$$

$r = 86.67$  meters.

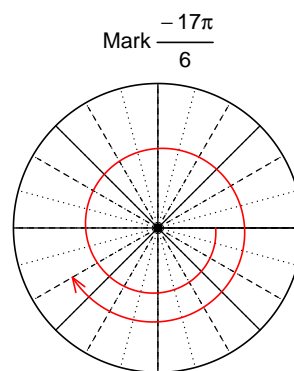
### Question 2

Consider angles  $\frac{11\pi}{4}$  and  $\frac{-17\pi}{6}$ . For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for  $\sin\left(\frac{11\pi}{4}\right)$  and  $\cos\left(\frac{-17\pi}{6}\right)$  by using a unit circle (provided separately).



Find  $\sin(11\pi/4)$

$$\sin(11\pi/4) = \frac{\sqrt{2}}{2}$$



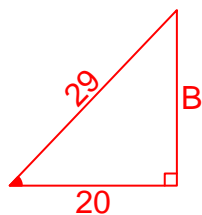
Find  $\cos(-17\pi/6)$

$$\cos(-17\pi/6) = \frac{-\sqrt{3}}{2}$$

### Question 3

If  $\cos(\theta) = \frac{-20}{29}$ , and  $\theta$  is in quadrant II, determine an exact value for  $\tan(\theta)$ .

Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



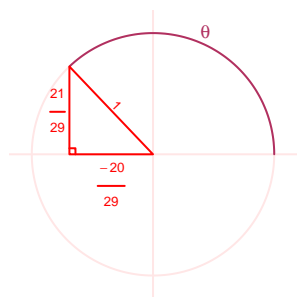
Solve the Pythagorean Equation

$$20^2 + B^2 = 29^2$$

$$B = \sqrt{29^2 - 20^2}$$

$$B = 21$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\tan(\theta) = \frac{\frac{21}{29}}{\frac{-20}{29}} = \frac{-21}{20}$$

### Question 4

A mass-spring system oscillates vertically with an amplitude of 6.68 meters, a midline at  $y = -4.02$  meters, and a frequency of 5.49 Hz. At  $t = 0$ , the mass is at the midline and moving down. Write an equation to model the height ( $y$  in meters) as a function of time ( $t$  in seconds).

Any of these equations would get full credit.

$$y = -6.68 \sin(2\pi 5.49t) - 4.02$$

or

$$y = -6.68 \sin(10.98\pi t) - 4.02$$

or

$$y = -6.68 \sin(34.49t) - 4.02$$